(19) JAPANESE PATENT OFFICE

PATENT ABSTRACTS OF JAPAN

(11) Publication number: 02148645 A

(43) Date of publication of application: 07.06.90

(51) Int. Cl H01J 11/00

(21) Application number: 63304509

(22) Date of filing: 30.11.88

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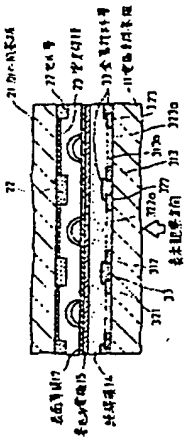
(54) GAS DISCHARGE PANEL

(57) Abstract:

PURPOSE: To improve the luminous efficiency and brightness and enable a clear color luminescent display by directly observing the luminescence by the excitation of a phosphor film through each pair of discharge keeping electrodes, an insulating layer, and a glass base each of which is transparent on the opposite side without passing through the phosphor film.

CONSTITUTION: An electrode support base 11 is formed of a transparent glass base, and mutually adjacent discharge keeping electrodes of each pair of transparent discharge keeping electrodes on said base, for example, between 321 and 312, are shortcircuited by a thick metal material layer 33 such as gold Au. When a voltage pulse is applied to the electrode drawing metal material layer 33, the discharge simultaneously occurs also in a read discharge cell related to the adjacent non-selected keeping discharge cell, but this read discharge is continued only in the selected keeping discharge cell to which the voltage pulse is applied. By the discharge of the selected keeping discharge cell, a phosphor 23 provided on a cover base 21 generates an excited color display light and directly exhibits a color display on the display observing surface of the transparent electrode support base 11. Hence, an observer can visually recognize a highly bright and clear color display.



⑲日本国特許庁(JP)　⑪特許出願公開

⑫公開特許公報(A)　平2−148645

⑤Int.Cl.⁵	識別記号	庁内整理番号	㊸公開　平成2年(1990)6月7日
H 01 J 11/00	K	8725−5C	

審査請求　未請求　請求項の数 2　(全5頁)

㊹発明の名称　ガス放電パネル

㉑特　願　昭63−304509
㉒出　願　昭63(1988)11月30日

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明細書

1. 発明の名称

ガス放電パネル

2. 特許請求の範囲

(1) ガス放電空間を挟んで対向する少なくとも片方が透明な一対の絶縁基板(11, 21)を有し、

視覚側に配置する前記透明な一方の絶縁基板(11)には、それぞれ隣接して対をなす複数の透明導電膜よりなる放電維持電極(31i, 32j)を複数組並べて配設すると共に、隣接した各放電維持電極対の相互に隣接する片側の放電維持電極間を電極引き出し用の金属材料層(33)により接続し、その上に透明な絶縁膜(14)を介して該放電維持電極(31i, 32j)と交差する方向に複数本の書込み電極(15)を配設し、前記各書込み電極(15)と各放電維持電極対の片側電極との各交点部に書込み放電セル、該書込み放電セルに隣接する各放電維持電極対の対向部に放電維持セルをそれぞれ形成してなり、

背面側に配置する前記他方の絶縁基板(21)には、前記各放電維持セルに対応する位置に蛍光体膜(23)を配設したことを特徴とするガス放電パネル。

(2) ガス放電空間を挟んで対向する少なくとも片方が透明な一対の絶縁基板(11, 21)を有し、

視覚側に配置する前記透明な一方の絶縁基板(11)にはそれぞれ隣接して対をなす複数の透明導電膜よりなる放電維持電極(31i, 32j)を複数組並べて配設し、かつ背面側に配置する他方の絶縁基板(21)には前記放電維持電極(31i, 32j)と交差する方向に複数本の書込み電極(15)を配設し、それら書込み電極(15)と放電維持電極対の片側電極との各交点部に書込み放電セル、該書込み放電セルに隣接する各放電維持電極対の対向部に放電維持セルをそれぞれ形成してなり、

さらに前記隣接した各放電維持電極対の相互に隣接する片側の放電維持電極間を電極引き出し用の金属材料層(33)により接続し、かつ前記他方の絶縁基板(21)上の前記各放電維持セルに対応した位置に蛍光体膜(23)を配設したことを特徴とするガス放電パネル。

3. 発明の詳細な説明

〔概　要〕

ディスプレイ装置などに用いられる蛍光体を組合わせたカラー表示用のガス放電パネルに関し、

蛍光体膜による輝度及び発光効率の低下や該蛍光体膜の膜厚に起因する輝度むらを容易に解消することを目的とし、

ガス放電空間を挟んで対向する一対の絶縁基板の内の一方に蛍光体膜を設け、他方にそれぞれ隣接して対となる複数の電極を複数組並べて配設したパネル構成において、前記他方の基板を透明基板により形成し、該基板上の電極を透明導電膜で形成すると共に、隣接した各電極対の相互に隣接する片側の電極間を電極引き出し用の金属材料層により接続し、この透明な電極配設基板を通して蛍光体によるカラー表示光を視覚するように構成し、また前記電極対は放電維持セルを画定する放電維持電極対として用いられ、この放電維持電極と交差してその交点部に書込み放電セルを画定する書込み電極が前記一対の基板の何れか一方に形成される構成とする。

〔産業上の利用分野〕

本発明はディスプレイ装置などに用いられるガス放電パネルの改良に係り、特に蛍光体を組合わせたカラー表示用のガス放電パネルに関するものである。

ガス放電光を利用して文字や図形を表示するガス放電パネルとしてＤＣ駆動形、或いはＡＣ駆動形の対向電極放電型及び一方の基板側にのみ放電電極を配設した面放電型のものが種々実用化されている。またこれらのガス放電パネルに蛍光体を組合わせ、放電時の紫外線により蛍光体を励起して所要のカラー発光表示を行うガス放電パネルも既に提案されている。

このような蛍光体と組合わせたカラー表示用のガス放電パネルとしては、その構造上から面放電型のガス放電パネルが有利であるが、蛍光体膜の表面からの発光を利用してカラー表示を行うため、輝度が低く、鮮明なカラー表示像が得られない傾向がある。このため、高輝度で鮮明なカラー表示像の得られパネル構造が必要とされている。

〔従来の技術〕

従来のカラー表示用の面放電型ガス放電パネルを第４図に示す。このパネルは電極支持基板として機能する下側の一方のガラス基板11上にそれぞれ隣接して対をなす櫛歯突出部12a，13aを有する縦方向のCr-Cu-Crの三層構造からなる放電維持電極12，13が設けられ、相互に近接対向する櫛歯突出部12aと13aによって放電維持セルScが構成されている。

またこれら放電維持電極対12と13の上に低融点ガラスなどの絶縁膜14を介して横方向の書込み電極(アドレス電極)15及び壁電荷干渉防止用の電荷障壁16が配設されている。これら書込み電極15と維持放電電極対の何れか一方(図示の場合12)との交点部には書込み放電セルHcが構成される。そして該書込み電極15及び電荷障壁16上に図示しない酸化マグネシウム(MgO) などからなる表面薄膜が施されている。

またこの電極支持基板11に対向するカバー用の上側の他方のガラス基板21の内面には、前記放電維持電極12，13の櫛歯突起部12a，13a間に定まる放電維持セルを画定するメッシュ状のセル層22が配設され、そのセル層22で囲まれた区画内にカラー表示用の蛍光体膜23が被着されている。

このようにして形成された前記電極支持基板11とカバー用基板21とは、その周囲を気密に封止し、かつそのガス封入空間に放電用ガスが封入されて、ガス放電パネルが完成する。

そしてカラー表示は、選択された書込み放電セルHcに書込み放電を発生させた後、この放電を隣接する維持放電セルScに引継がせ、その維持放電による紫外線により、対応する蛍光体膜23が部分的に励起されて、カバー用基板21面を通してカラー発光表示が観察できる。

なお、書込み電極15をカバー用基板21側に設ければ対向放電型のガス放電パネルとして構成できる。

〔発明が解決しようとする課題〕

上記従来のカラー表示用ガス放電パネルでは、蛍光体膜23が被着されたカバー用基板21側が画像観察(視覚)面であるため、該蛍光体膜23による発光の減衰により輝度が低下し、発光効率が悪くなる。また蛍光体膜23の膜厚の不均一による輝度むらが生じる等、鮮明なカラー表示像が得られないという問題があった。

本発明は上記した従来の問題点に鑑み、蛍光体膜による輝度、発光効率の低下や蛍光体膜の膜厚に起因する輝度むらを解消した新規なカラー発光表示用のガス放電パネルを提供することを目的とするものである。

〔課題を解決するための手段〕

上記目的を達成するため、本発明では放電維持電極対を配設する一方の基板を視覚側とし、この基板を透明基板で形成すると共に、この上に透明導電膜により放電維持電極を形成し、かつ隣接した各放電維持電極対の相互に隣接する片側の放電維持電極間を、電極引き出し用の金属材料層により接続した構成を採用している。

〔作　用〕

上記したように透明な放電維持電極対が配置された基板を表示観察面とすることにより、それら電極対による放電時の対向側基板面の蛍光体の励起発光が直接視認でき、従って発光効率及び輝度が向上し、鮮明なカラー発光表示が実現できる。

また対となる複数の放電維持電極をＩＴＯ(Indium Tin Oxide)などからなる透明導電膜で形成すると、電極抵抗が高くなると共に、電極形成時の熱サイクルにより断線し易くなる不都合があるが、これらの問題は各放電維持電極対の互いに隣接する片側の放電維持電極間を接続した電極引き出し用金属材料層の存在により解消できる。

〔実施例〕

以下図面を用いて本発明の実施例について詳細に説明する。

第１図は面放電型ガス放電パネルに実施した例の電極支持基板を示す要部斜視図であり、第４図の従来例と同等部分には同一符号を付している。

この図で示す実施例が第４図の従来例と異なる点は、電極支持基板11が透明ガラス基板からなり、その上に配列する複数組の放電維持電極31i，32j（i，j は正の整数）がＩＴＯ(Indium Tin Oxide)などを薄膜形成技法により形成した透明導電膜からなり、その上に積層する絶縁膜14が透明な誘電体材料(例えば低融点ガラス)から形成され、更にその透明な各放電維持電極対31i，32jの相互に隣接する片方の放電維持電極、例えば321と312間とを金(Au)等の厚膜の金属材料層33により図示の如く短絡したことである。

この金属材料層33は短絡(接続)した２本の放電維持電極321，312の外部駆動回路に対する電極引き出し線であると共に、両電極の抵抗値を下げる機能、並びに電極形成時の熱サイクルに起因して生じた断線の修復機能を持つ。

第２図はこのように構成した電極支持基板11とカバー用基板21とをガス放電空間を介して対向配置した際の要部断面図を示すが、本実施例の特徴に従って当該電極支持基板11を視覚側、即ち表示観察面にしている。17は前記書込み電極15及び図示しない電荷障壁上に被覆されたMgO等からなる表面薄膜である。

このようなパネル構成において選択された放電維持セルに放電を発生させるには、従来例と同様に当該選択維持セルに隣接する書込み放電セルに書込み放電を発生させる。この時、電極引き出し用金属材料層33に電圧パルスが印加される関係上、隣の非選択維持放電セルに関連の書込み放電セルに対しても同時に放電が生じるが、この書込み放電は電圧パルスが印加されている選択維持放電セルにのみ継続される。この選択維持放電セルの放電によって、カバー用基板21に設けた蛍光体23が励起されカラー表示光を発生し、透明な電極支持基板11の表示観察面に直接カラー表示を現出する。

従って、観察者は高輝度で、かつ鮮明なカラー表示を視覚認識することができる。因みに不透明

な金属材料層33及び書込み電極15は、維持放電光の周辺部分を遮蔽してシャープな表示スポットを形成する作用効果がある。

第3図は本発明を対向放電型ガス放電パネルに実施した例を示す要部断面図である。

このパネルが前述した第2図の面放電型ガス放電パネルと異なる点は、書込み電極15が蛍光体膜23を形成する側の他方のガラス基板21に設けられ、その書込み電極15には誘電体材料からなる絶縁膜41が被覆され、この絶縁膜41上に蛍光体膜23が形成された点である。

なお、他方のガラス基板11側の各放電維持電極対31i, 32jに対する前記書込み電極15及び蛍光体膜23の投影的な位置は前記第1図及び第2図で示す面放電型ガス放電パネルと変わりはない。またこのパネルでは単位放電セルをより確実に画定するために、セル層22, 42が両側のガラス基板11, 21に設けられ、それぞれ対となる書込み放電セルと放電電極維持セルとを単一のガス空間内に形成している。

従って、かかる構成のガス放電パネルにおいても、カラー表示光は透明な一方のガラス基板11を通して直接観察できるので、高輝度で、かつ鮮明なカラー表示を現出できる。

〔発明の効果〕

以上の説明から明らかなように、本発明に係るガス放電パネルの構造によれば、蛍光体膜の励起による発光を該蛍光体膜中を通さずに、対向側のそれぞれ透明な各放電維持電極対、絶縁層及びガラス基板を通して直接観察するので、発光効率及び輝度が向上し、鮮明なカラー発光表示が可能となる等、実用上の効果は大きい。

4. 図面の簡単な説明

第1図は本発明を適用した面放電型ガス放電パネルにおける片側ガラス基板の電極構成を示す要部斜視図、

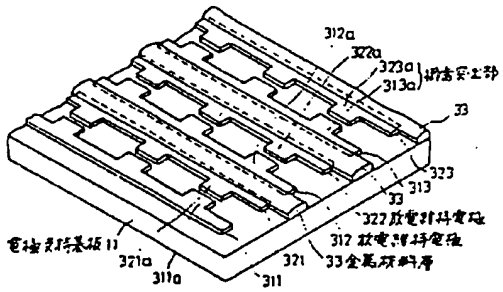
第2図は本発明の上記面放電型ガス放電パネルを示す要部断面図、

第3図は本発明を適用した対向放電型ガス放電パネルを示す要部断面図、

第4図は従来のカラー表示用の面放電型ガス放電パネルを説明するための要部分解斜視図である。

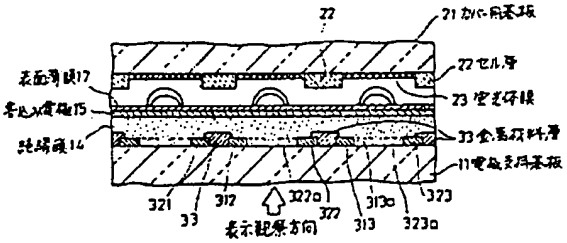
第1図乃至第3図において、

11は一方のガラス基板、14, 41は絶縁膜、15は書込み電極、21は他方のガラス基板、22, 42はセル層、23は蛍光体膜、31i, 32jは放電維持電極、31ia, 32jaは櫛歯突出部、33は電極引き出し用金属材料層をそれぞれ示す。



本発明に係る電極基板側の電極構成を示す要部斜視図

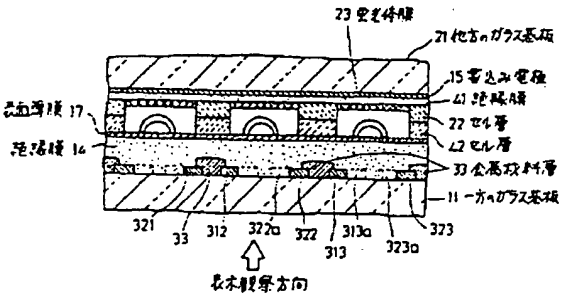
第1図



本発明の面放電型ガス放電パネルを示す要部断面図

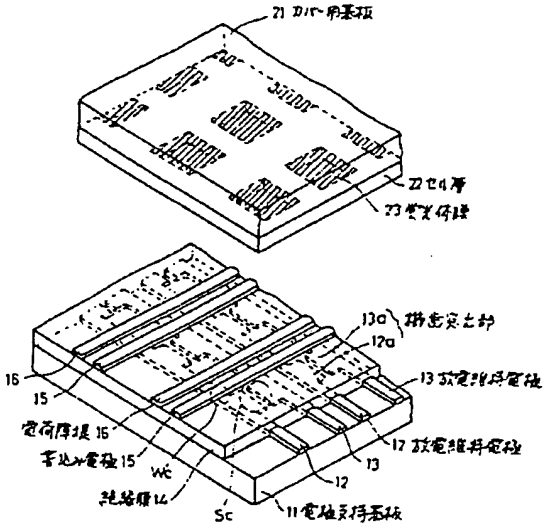
第2図

代理人 弁理士 井 出 良 一



本発明の対向放電型ガス放電パネルを示す要部断面図

第 3 図



従来のガス放電パネルを説明する要部分解斜視図

第 4 図

Japanese-into-English Translation of JP Publication No. 2-148645 Published on June 7, 1990

SPECIFICATION

1. Title of the Invention

GAS DISCHARGE PANEL

2. What is claimed is:

(1) A gas discharge panel comprising:

one pair of insulating substrates (11 and 22) opposed to each other with a gas discharge space interposed therebetween, at least one of the one pair of the insulating substrates (11 and 22) being transparent;

a plurality of pairs of electrodes (31i and 32j) that are made of a transparent conductive film, each of which pairs is constituted of adjacent two of them, and which are arranged on the at least one transparent (11) of the pairs of insulating substrates located in a viewing side; and

a plurality of write electrodes (15) formed on the plurality of pairs of electrodes (31i and 32j) with a transparent insulating film (14) interposed therebetween extending in directions intersecting with the plurality of pairs of discharge sustaining electrodes (31i and 32j),

wherein adjacent two discharge sustaining electrodes

of respective adjacent two pairs of the discharge sustaining electrodes are connected by a metal substance layer (33) for electrode leads; a write discharge cell is formed at each of intersections between the write electrodes (15) and ones of the pairs of the discharge sustaining electrodes; a discharge sustaining cell is formed at an opposed position of a pair of discharge sustaining electrodes next to the write discharge cell; and a fluorescent substance film (23) is formed at positions on the other one (21) of the pair of insulating substrates located in a rear side, respectively corresponding to the discharge sustaining cells.

(2) A gas discharge panel comprising:

one pair of insulating substrates (11 and 22) opposed to each other with a gas discharge space interposed therebetween, at least one of the one pair of the insulating substrates (11 and 22) being transparent;

a plurality of pairs of electrodes (31i and 32j) that are made of a transparent conductive film, each of which pairs is constituted of adjacent two of them, and which are arranged on the at least one transparent (11) of the pairs of insulating substrates located on a viewing side; and

a plurality of write electrodes (15) formed on the other one (21) of the pair of insulating substrates located in a rear side in directions intersecting with the plurality of pairs of electrodes (31i and 32j),

wherein adjacent two electrodes of respective adjacent two pairs of the electrodes are connected by a metal substance layer (33) for electrode leads; a write discharge cell is formed at each of intersections between the write electrodes (15) and ones of the pairs of the discharge sustaining electrodes; a discharge sustaining cell is formed at an opposed position of a pair of discharge sustaining electrodes next to the write discharge cell; and a fluorescent substance film (23) is formed at positions on the other one (21) of the pair of insulating substrates, respectively corresponding to the discharge sustaining cells.

3. Detailed Description of the Invention

[Outline]

The present invention relates to a gas discharge panel for color display which is combined with a fluorescent substance, used in a display device and so on,

its object is to eliminate reduction in emission efficiency and brightness of a fluorescent substance film and uneven distribution of brightness caused by a film thickness with ease, and

a gas discharge panel of the present invention comprises: one pair of insulating substrates opposed to each other with a gas discharge space interposed therebetween, a fluorescent substance film formed on one of the pair of

insulating substrates; a plurality of pairs of electrodes each of which pairs is constituted of adjacent two of them, and which are arranged on the other of the pairs of insulating substrates; and write electrodes formed on one of the pair of insulating substrates, wherein the other of the pairs of insulating substrates are made of a transparent substrate; the electrodes thereon are made of a transparent film; adjacent two electrodes of respective adjacent two pairs of the electrodes are connected by a metal substance layer for electrode leads; the pairs of electrode are used as pairs of discharge sustaining electrodes defining discharge sustained cells; and the write electrode intersect with the discharge sustaining electrodes, defining write discharge cells at the intersections, whereby color display light from the fluorescent substance is sensed by a viewer through the transparent substrate on which the electrodes are arranged.

[Technical Field of the Invention]

The present invention relates to improvement on a gas discharge panel used in a display device and others and particularly, to a gas discharge panel for color display which is combined with a fluorescent substance.

There have been various kinds of gas discharge panels put into practical use which display characters and pictures

with the use of gas discharge emission: such as of an opposed electrode discharge type and a surface discharge type, in the latter of which discharge electrodes are only provided on one of a pair of substrates, wherein the gas discharge panels are further classified into two categories of a DC drive type and an AC drive type. Further, a gas discharge panel has also been proposed in which one of the above described gas discharge panels is combined with a fluorescent substance and the fluorescent substance is excited by ultraviolet emitted from the discharge, thereby performing a desired color emission display.

Such a surface discharge type gas discharge panel which is combined with a fluorescent substance is advantageous for structural reasons, but the surface discharge type gas discharge panel has a nature such that brightness is too low to perform color display with the use of emission from the surface of a fluorescent substance film, which makes it impossible to obtain a sharp color display image. Therefore, there has been a need for a panel structure by which a sharp color display image of high brightness is achieved.

[Prior Art]

In FIG. 4, There is shown a conventional surface discharge type gas discharge panel for color display. The

panel comprises discharge sustaining electrodes 12 and 13 of a three layer structure extending longitudinal directions, including comb-like protrusions 12a, 13a, any adjacent two of the protrusions constituting a pair, are arranged on a lower side one 11 of a pair of glass substrates, which functions as an electrode support substrate, wherein discharge sustaining cells Sc are each formed by the come-like protrusions 12a and 13a that are adjacent and opposed to each other.

Further, write electrodes (address electrodes) 15 and charge barrier strips 16 for preventing wall charge interference from occurring are arranged, in a laterally extending manner, above the discharge sustaining electrode pair 12 and 13 with an insulating film 14 made of, for example, a low melting glass interposed therebetween. Write discharge cells Wc are each formed at one (12 in case of the figure) of intersections between a write electrode 15 and a pair of discharge sustaining electrodes. A surface thin film, not shown, made of magnesium oxide (MgO) is formed on the write electrode 15 and the charge barrier strip 16.

The other glass substrate 21 for a cover in the upper side, which is opposed to the electrode support substrate 11, comprises, on the inner surface thereof, a mesh-like cell layer 22 which defines a discharge sustaining cell determined between the come-like protrusions 12a and 13a of

the discharge sustaining electrodes 12 and 13. A fluorescent substance film 23 for color display is provided in areas enclosed by the cell layer 22.

The electrode support substrate 11 and the cover substrate are 21, which are thus constructed, are gastight sealed along the peripheries thereof and the gas filled space is filled with a discharge gas, thus completing a gas discharge panel.

In order to present color display, write discharge is generated in a selected write discharge cell, subsequently the discharge is transferred to the discharge sustaining cell Sc next to the selected write discharge cell and a corresponding fluorescent substance film 23 is partially excited by ultraviolet emitted from the sustained discharge, thereby enabling observation of color emission display through the surface of the cover substrate 21.

It should be noted that if the write electrode 15 is disposed in the cover substrate 21 side of the above described surface discharge type, the gas discharge panel can be altered to an opposed electrode discharge type.

[Problems to be Solved]

In the above described conventional color display gas discharge panel, since the cover substrate 21 side on which a fluorescent substance film 23 is formed is a image

observing (viewing) surface, brightness is reduced and emission efficiency is deteriorated by attenuation of light emission in the fluorescent substance 23. Further, uneven distribution of brightness takes places due to a thickness variation of the fluorescent substance film 23. Therefore, a sharp color display image cannot be obtained and a problem has arisen.

The present invention has been made in light of the above described conventional problem and it is an object of the present invention to provide a novel gas discharge panel for color light emission display in which reduction in brightness and emission efficiency, and a brightness uneven distribution caused by a thickness variation of the fluorescent substance film are eliminated.

[Means to Solve the Problems]

In order to achieve the object, the following constitution is adopted in the present invention: one substrate on which pairs of discharge sustaining electrodes are arranged is used as a viewing side, the one substrate being a transparent substrate, discharge sustaining electrodes are fabricated on the transparent substrate using a transparent conductive film, and adjacent two discharge sustaining electrodes of respective adjacent two pairs of the discharge sustaining electrodes are connected by a metal

substance layer for electrode leads.

[Operation]

As described above, since a substrate on which pairs of transparent discharge sustaining electrodes are arranged is used as a display observing surface, a viewer can directly recognize, through a visual sense, excited light emission from a fluorescent substance on the opposed side substrate when discharges occur between the pairs of transparent discharge sustaining electrodes, therefore emission efficiency and brightness are improved and color light emission display can be realized with sharpness.

When a plurality of pairs of discharge sustaining electrodes are made of a transparent conductive film such as a film made of ITO (indium tin oxide), there arise inconveniences such that not only does an electrode resistance increase, but disconnection is apt to occur due to heat cycles in electrode formation. However, such problems can be solved by the presence of a metal substance layer for electrode leads connecting between adjacent two discharge sustaining electrodes of respective adjacent two pairs of the discharge sustaining electrodes.

[Embodiment]

Detailed description will be given of an embodiment of

the present invention using the accompanying drawings.

FIG. 1 is a perspective view showing main portions of an electrode support substrate of an example in which the present invention is applied on a surface discharge type gas discharge panel, wherein equivalent parts to the conventional example of FIG. 4 are designated by the same marks.

Different points of the example shown in FIG. 1 from the conventional example of FIG. 4 are in that the electrode support substrate 11 is a transparent glass substrate; a plurality of pairs of discharge sustaining electrodes 31i and 32j, where i and j are respectively positive integers, are arranged on the electrode support substrate 11, the discharge sustaining electrodes 31i and 32j being made of a transparent conductive film formed by a thin film forming technique using ITO (indium tin oxide) or the like; an insulating film 14 made of a transparent dielectric substance (for example, a low melting glass) is formed on the discharge sustaining electrodes 31i and 32j; and in addition, a metal substance layer 33 constituted of a thick film made of gold (Au) or the like short-circuits between adjacent two transparent discharge sustaining electrodes, for example, 321 and 312 of respective adjacent two pairs of the transparent discharge sustaining electrodes 31i and 32j as shown in the figure.

The metal substance layer 33 is not only electrode leads for an external drive circuitry of two discharge sustaining electrodes 321 and 312 which are short-circuited by electrical connection, but has a function to reduce resistance values of the electrodes and repair disconnection caused by heat cycles when the electrodes are fabricated.

FIG. 2 is a sectional view showing main portions of a configuration in which the electrode support substrate 11 with such a structure and the cover substrate 21 are arranged in an opposed manner with a gas discharge space interposed therebetween, wherein the electrode support substrate 11 is used as a viewing side, that is a display observing side. A numerical mark 17 indicates a surface thin film made of MgO or the like, which is formed on the write electrodes 15 and the charge barrier strips not shown.

In such a panel configuration, a write discharge is generated in a write cell next to a selected discharge sustaining cell in order to generate discharge in the selected discharge sustaining cell similar to the conventional example. At this time, discharge is simultaneously generated in a write discharge cell associated with a non-selected discharge sustaining cell next to the metal substance layer 33 for an electrode lead since a voltage pulse is applied on the metal substance layer 33 for electrode leads, but the write discharge

continues in a selected discharge sustaining cell only to which a voltage pulse is applied. The fluorescent substance 23 provided on the cover substrate 21 is excited by discharge in the selected discharge sustaining cell and emits color display light and a color display is directly presented on a display observing surface of the transparent electrode support 11.

Accordingly, a viewer can visually recognize a highly bright, sharp color display. Incidentally. The non-transparent metal substance layer 33 and the write electrode 15 exerts an action and effect to delineate a sharp display spot by screening the peripheral portion of the sustained discharge light flux.

FIG. 3 is a sectional view showing an example in which the present invention is applied to an opposed electrode discharge type gas discharge panel.

The panel is different from the surface discharge type gas discharge panel of FIG. 2 in that the write electrodes 15 are located on the glass substrate 21 in the other side on which the fluorescent substance film 23 is formed, an insulating film 41 made of a dielectric substance is formed on the write electrodes 15 to cover and the fluorescent substance film 23 is further formed on the insulating film 41.

It should be noted that there are no alteration in

positions of projection of the write electrodes 15 and the fluorescent substance film 23 relative to the pairs of discharge sustaining electrodes 31i and 32j on the glass substrate 11 in the one side as compared with the surface discharge gas discharge panel of FIGs. 1 and 2. Further, in order to define unit discharge cells with more of reliability, cell layers 22 and 42 are provided on both of the glass substrates 11 and 21, which confine a write discharge cell and a discharge sustaining electrode cell, which constitute a pair, within a single gas space.

Therefore, since color display light can directly be observed through a transparent glass substrate in one side of the gas discharge panel with such a configuration as well, a highly bright, sharp color display can be realized.

[Effect of the Invention]

As is apparent from the description above, in the configuration of a gas discharge panel according to the present invention, emission efficiency and brightness is improved and a sharp color light emission display is obtainable together with other effects, thus exerting great effects in practical aspect since light emission caused by excitation of a fluorescent substance can be viewed directly through the pairs of transparent discharge sustaining electrodes, the transparent insulating layer and the

transparent gas substrate while not viewing through the fluorescent substance film.

4. Brief Description of the Drawings

FIG. 1 is a perspective view showing main portions of configuration of electrodes on a glass substrate in one side of a surface discharge type gas discharge panel to which the present invention is applied.

FIG. 2 is a sectional view showing main portions of the surface discharge type gas discharge panel of the present invention.

FIG. 3 is a sectional view showing an opposed electrode discharge type gas discharge panel to which the present invention is applied.

FIG. 4 is an exploded perspective view for illustrating main portions of a conventional surface discharge type gas discharge panel for color display.

In FIGs. 1 to 3,

11 indicates one of glass substrates;

14 and 41 insulating films;

15 write electrodes;

21 the other of glass substrates;

22 and 42 cell layers;

23 a fluorescent film;

31i and 32j discharge sustaining electrodes;

31ia and 32j a comb-like protrusions; and

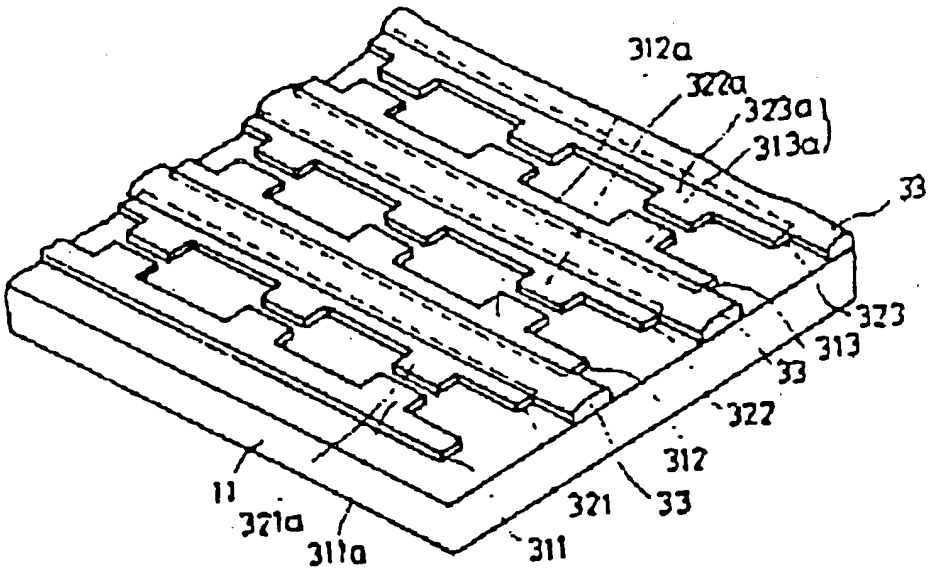
33 a metal substance layer for electrode leads.

11: electrode support substrate

33: metal substance layer

312 and 322: discharge sustaining electrodes

323a and 313a: comb-like protrusions



A perspective view showing main portions of electrode configuration in an electrode support substrate side according to the present invention.

FIG. 1

11: electrode support substrate

14: insulating film

15: write electrodes

17: surface thin film

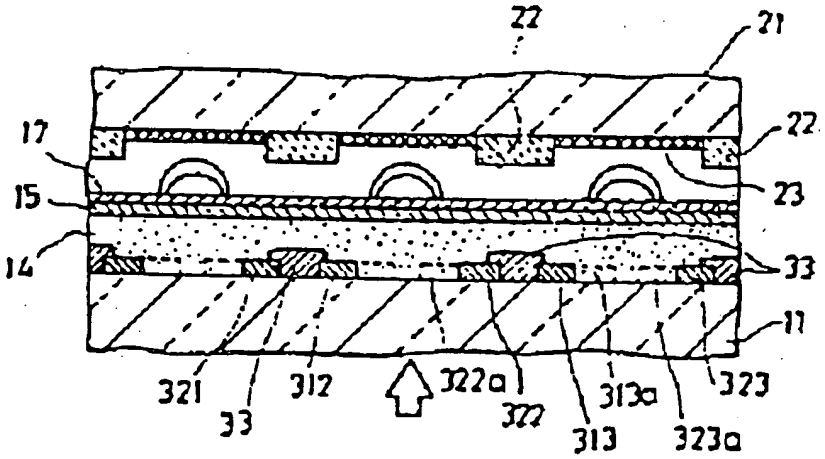
21: cover substrate

22: cell layers

23: fluorescent substance film

33: metal substance layer

display observing direction



A sectional view showing main portions of a surface discharge type gas discharge panel of the present invention.

FIG. 2

11: glass substrate in one side

14: insulating film

15: write electrodes

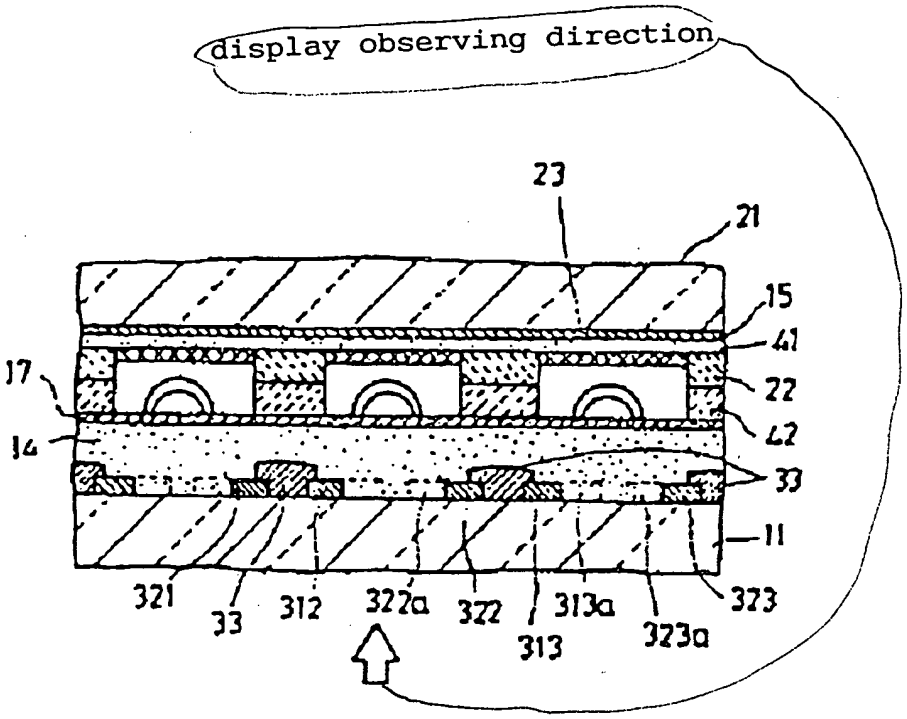
17: surface thin film

21: glass substrate in the other side

22 and 42: cell layers

23: fluorescent substance film

33: metal substance layer



A sectional view showing main portions of an opposed electrode discharge type gas discharge panel of the present invention.

FIG. 3

11: electrode support substrate

12 and 13: discharge sustaining electrodes

12a and 13a: comb-like protrusions

14: insulating film

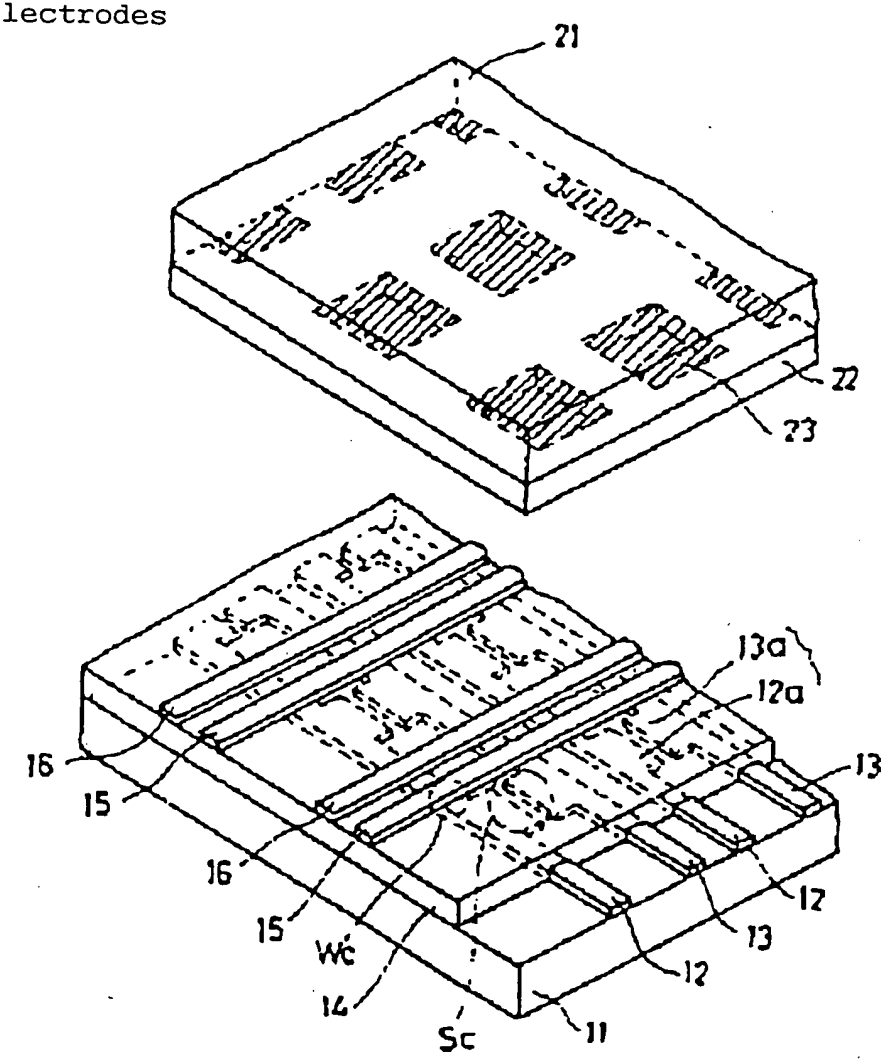
15: write electrodes

16: charge barrier strips

21 cover substrate

22: cell layer

23 fluorescent substance fil



An exploded perspective view for illustrating main parts of a conventional gas discharge panel.

FIG. 4